REMARKS

The Applicant is filing this Amendment and Response in response to an Official Action dated July 12, 2005. At the time of the Official Action, claims 1-10 and 26-35 were pending. In this Response and Amendment, claim 36 is added. Accordingly, claims 1-10 and 26-36 are currently pending. Claims 1-5, 6 and 26 are amended.

In the Office Action, claims 1-5 and 26-35 were rejected under 35 U.S.C. § 103(a) as being obvious based on U.S. Patent No. 5,714,766 to Chen et al. ("the Chen reference") in view of U.S. Patent Publication No. 2005/0130258 to Trent et. al ("the Trent reference") and U.S. Patent No. 6,361,863 to Gambino et. al ("the Gambino reference"). Claims 6-10 were rejected under 35 U.S.C. § 103(a) as being obvious based on U.S. Patent Publication No. 2002/0021158 to Mullarkey ("the Mullarkey reference") in view of the Chen reference and the Gambino reference. Each of these rejections is addressed in detail below.

The Rejection of Claims 1-5 and 26-35 Under 35 U.S.C. § 103

With respect to the rejection of claims 1-5 and 26-35 under 35 U.S.C. § 103 as being rendered obvious by the Chen reference in view of the Trent reference and the Gambino reference, the rejection of claim 1 is exemplary. The text of that rejection is set forth below:

> 2. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (US 5,714,766) in combination with Trent el al. (US publication 2005/0130258) and Gambino et al. (US patent 6,361,863).
>
> With respect to claim 1, Chen et al. teach a vertical tunneling transistor, comprising (see fig. 6 and associated text):
>
> a channel 26 disposed on a substrate 20;
>
> a quantum dot 34, 34', or 34" disposed so that the channel is between the quantum dot and the substrate;

a gate 16 is disposed so that the quantum dot is between the gate and the channel; and

wherein an axis through the channel, quantum dot, and the gate is substantially perpendicular to an upper surface of the substrate.

Further with respect to claim 1, Chen et al. fail to teach that the quantum dot comprises of [sic] platinum.

Trent et al. teach [a] quantum dot made of platinum. See claims 24 and 51. It would have been obvious to one of ordinary skill in the art of making semiconductor devices to use [a] quantum dot made of platinum in the device of [C]hen et al. to obtain devices having nanostructures. See [0013] ...

Gambino et al. teach using halfnium oxide as tunneling barrier material. See col. 3, lines 55-65.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate the above teaching of Gambino et al. into the device of Chen et al. to provide suitable tunneling barrier effect. See col. 3, lines 55-65.

Office Action, pp. 2-3.

The Applicant respectfully traverses the rejection. The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227

U.S.P.Q. 972 (B.P.A.I. 1985). When prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988). Moreover, the proposed modification cannot render the prior art unsatisfactory for its intended purpose. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988).

The Applicant respectfully asserts that several features of independent claim 1 are not disclosed by the cited references. For example, independent claim 1, as amended, recites "a memory element disposed on a substrate; and *an access device coupled to the memory element.*" (Emphasis added.) In contrast, the Chen reference merely teaches "a memory cell or storage device 10." *Chen et. al*, col. 3, ll. 39-40. Moreover, the Trent reference and the Gambino reference make no mention of an access device coupled to a memory element. Accordingly, the cited references fail to teach or suggest the above-recited features of independent claim 1. As such, the Applicant

respectfully asserts that independent claim 1 and the claims that depend therefrom are patentable over the Chen reference in light of the Trent reference and the Gambino reference.

The Applicant asserts that several features of independent claim 26 are not disclosed by the cited references. For example, independent claim 26, as amended, recites "disposing a spacer adjacent the sidewall in the aperture *that reduces a dimension of the aperture that is substantially parallel to the substrate to a sub-photolithographic size*." (Emphasis added.) In contrast, the Chen reference merely teaches spacers 40 and 41 that provide a barrier to electrons or holes. *See Chen et. al*, col. 4, ll. 20-25. Moreover, the Trent reference and the Gambino reference make no mention of a spacer. Accordingly, the cited references fail to teach or suggest the above-recited features of independent claim 26. As such, the Applicant respectfully asserts that independent claim 26 and the claims that depend therefrom are patentable over the Chen reference in light of the Trent reference and the Gambino reference.

The Rejection of Claims 6-10 Under 35 U.S.C. § 103

With respect to the rejection of claims 6-10 under 35 U.S.C. § 103 as being rendered obvious by the Mullarkey reference in view of the Chen reference and the Gambino reference, the Examiner stated:

> 2. Claims 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mullarkey (US 2002/0021158) in combination with Chen et al. (US 5,714,766) and Gambino et al. (US patent 6,361,863).
>
> With respect to claim 6, Mullarkey teaches an integrated circuit device, comprising (see [0007]):
> a substrate or wafer 10;

a memory array that includes a plurality memory cells disposed on the substrate, each of the plurality of memory cells comprising a memory element and an access transistor.

However, Mullarkey fails teach that the access transistor is a transistor as recited in present claims 6-10.

Chen et al. teach a transistor as recited in present claims 6-10. See the above rejection.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to use the transistor as taught in Chen et al. in the device of Mullarky because the transistor of Chen et al. allows storage of [a] multi-bit word. See col. 2, lines 35-38 of Chen et al.

Further with respect to claim 6, Chen et al. fail to teach that the quantum dot comprises of [sic] platinum.

Trent et al. teach [a] quantum dot made of platinum. See claims 24 and 51.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to use [a] quantum dot made of platinum in the device of Chen et al. to obtain devices having nanostructures. See [0013].

Office Action, pp. 5-6.

The Applicant respectfully traverses this rejection. In particular, the proposed combination renders the Chen reference unsatisfactory for its intended purpose, which is to store data in the charge state of a quantum dot. *See Chen et. al*, col. 3, ll. 38-42. The Examiner proposed replacing the access transistor taught by the Mullarkey reference with the memory element taught by the Chen reference. Office Action, page 5. However, as stated above, the Chen reference teaches a memory element, and the Mullarkey reference teaches a memory cell 18 with a capacitor memory element. Mullarkey et. al, paragraph 7. Thus, the proposed

modification places two memory elements in series, without an access transistor. In other words, the proposed modification couples a quantum dot memory element 10 from the Chen reference to a capacitor memory element 18 from the Mullarkey reference. As such, the proposed modification renders the device taught by the Chen reference unsatisfactory for storing data in the charge state of a quantum dot. Accordingly, Applicant respectfully asserts that the proposed modification is inappropriate, and claims 6-10 are allowable.

Moreover, the cited references fail to teach or suggest several features of amended independent claim 6. For instance, claim 6, as amended, recites "a *self-aligned* quantum dot." (Emphasis added.) In sharp contrast, none of the cited references teach or suggest a self-aligned quantum dot. Therefore, for this reason alone, the Mullarkey reference, the Chen reference and the Gambino reference, taken alone or in combination, fail to teach or suggest *all* the features of independent claim 6. Accordingly, the Applicant respectfully asserts that independent claim 6 and the claims that depend therefrom are patentable over the Chen reference in light of the Trent reference and the Gambino reference.

Conclusion

In view of the remarks set forth above, the Applicant respectfully requests reconsideration of the Examiner's rejections and allowance of all pending claims 1-10 and 26-36. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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Barry D. Blount
Reg. No. 35,069
FLETCHER YODER
P.O. Box 692289
Houston, TX 77269-2289
(281) 970-4545